

High Performance Infrared Filters using a Low Loss Polymer

Completed Technology Project (2017 - 2021)



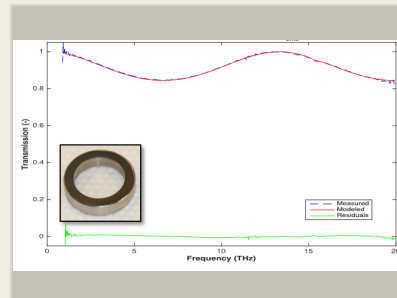
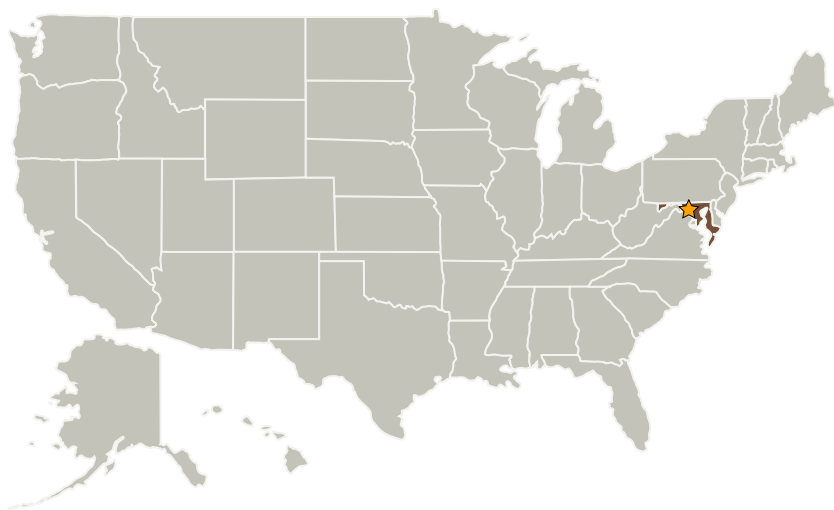
Project Introduction

We propose to design, fabricate, and test representative large area quasi-optical components using this low loss polymer materials with minimal absorption bands in the 10 to 100 um bandwidth.

Anticipated Benefits

The far-infrared observational window contains a rich pallet of atomic and fine structure lines, which can be used in constraining the content, structure, and evolution of protostars, protoplanetary disks, and molecular clouds. This spectral range provides a wealth of astrophysical data addressing how planetary systems form, where giant planets come from, and the conditions in stellar outflows and shocks. Development of optical components and systems that can achieve the necessary performance in a background limited environment in this waveband can enable new opportunities for space based and sub-orbital instruments. Current NASA missions include SOFIA, PIPER, and BETTII. Future NASA missions include Far-Infrared Surveyor as well as planetary or Earth Science applications which require high performance Far-IR optics.

Primary U.S. Work Locations and Key Partners



Transmission of free standing 8 um thick cyclic olefin copolymer film

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Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations

Maryland

Project Transitions

**October 2017:** Project Start**September 2021:** Closed out

Closeout Summary: We have completed designs of optical structures for far infrared filters. We have demonstrated fabrication processes to realize submicron lithographic structures and further demonstrated high aspect ratio etching of low-loss dielectric materials to demonstrate a fabrication process. Representative structures have been transferred to low loss polymer materials to demonstrate targeted optical components. The purpose of the Goddard Space Flight Center's Internal Research and Development (IRAD) program is to support new technology development and to address scientific challenges. Each year, Principal Investigators (PIs) submit IRAD proposals and compete for funding for their development projects. Goddard's IRAD program supports eight Lines of Business: Astrophysics; Communications and Navigation; Cross-Cutting Technology and Capabilities; Earth Science; Heliophysics; Planetary Science; Science Small Satellites Technology; and Suborbital Platforms and Range Services. Task progress is evaluated twice a year at the Mid-term IRAD review and the end of the year. When the funding period has ended, the PIs compete again for IRAD funding or seek new sources of development and research funding, or agree to external partnerships and collaborations. In some cases, when the development work has reached the appropriate Technology Readiness Level (TRL) level, the product is integrated into an actual NASA mission or used to support other government agencies. The technology may also be licensed out to the industry. The completion of a project does not necessarily indicate that the development work has stopped. The work could potentially continue in the future as a follow-on IRAD; or be used in collaboration or partnership with Academia, Industry, and other Government Agencies. If you are interested in partnering with NASA, see the TechPort Partnerships documentation available on the TechPort Help tab. <http://techport.nasa.gov/help>

Organizational Responsibility

Responsible Mission Directorate:

Mission Support Directorate (MSD)

Lead Center / Facility:

Goddard Space Flight Center (GSFC)

Responsible Program:

Center Independent Research & Development: GSFC IRAD

Project Management

Program Manager:

Peter M Hughes

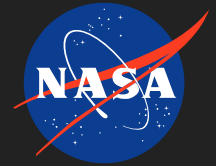
Project Managers:Keith M Jahoda
David H Richardson**Principal Investigator:**

Kevin L Denis

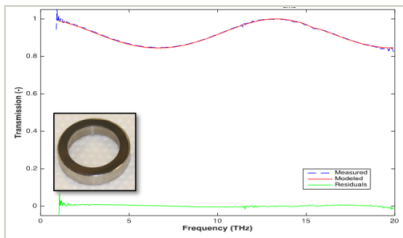
Co-Investigators:Edward J Wollack
Alyssa C Barlis

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Images



Transmission data of 8 um thick free standing cyclic olefin copolymer film

Transmission of free standing 8 um thick cyclic olefin copolymer film
(<https://techport.nasa.gov/image/102379>)

Links

NASA Goddard Facebook
(<https://www.facebook.com/NASA.GSFC>)

NASA Goddard Science Exploration Directorate
(<https://www.facebook.com/NASA.GSFC>)

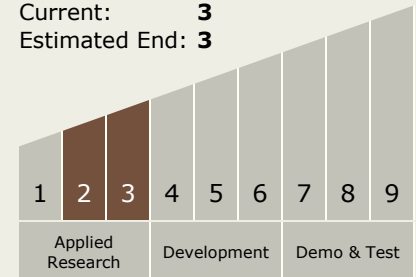
NASA Goddard Twitter
(https://twitter.com/intent/follow?screen_name=NASAGoddard)

Project Website:

<http://www.nasa.gov/centers/goddard/home/index.html>

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



Technology Areas

Primary:

- TX08 Sensors and Instruments
 - └ TX08.1 Remote Sensing Instruments/Sensors
 - └ TX08.1.3 Optical Components

Target Destinations

Earth, Others Inside the Solar System, Outside the Solar System

Supported Mission

Type

Planned Mission (Pull)